Nebraska.—2d, 4th, 5th, 6th, 9th, 10th, 11th, 13th, 17th, 29th, 30th.
Nevada.—4th.
New Hampshire.—1st, 6th, 7th, 8th, 11th.
New Jersey.—4th, 6th, 7th, 8th, 11th, 13th, 31st.
New Mexico.—4th.
New York.—4th to 8th, 10th, 11th.
North Carolina.—2d, 4th, 6th, 8th.
Ohio.—1st to 6th, 8th, 10th to 13th, 16th, 27th to 31st.
Oregon.—1st to 5th, 8th, 10th, 14th.
Pennsylvania.—4th, 5th, 7th, 8th, 11th, 12th, 13th, 16th, 20th, 25th.
Rhode Island.—7th, 8th. 11th.
South Carolina.—2d to 7th, 28th, 30th.
Tennessee.—2d to 7th.
Texas.—2d to 6th, 8th.
Utah.—2d.
Vermont.—4th, 6th, 7th, 8th, 11th.
Virginia.—4th, 6th, 7th, 8th, 10th, 11th, 14th, 21st, 31st.
Washington Territory.—7th, 16th.
West Virginia.—4th, 6th.
Wisconsin.—4th to 12th, 27th, 29th, 30th.

The phases of the moon (Washington mean time) during January, as given in "The American Ephemeris and Nautical Almanac" for 1887, are as follows: New moon, 23d, 9 h. 52.9 m.; first quarter, 1st, 19 h. 12.3 m., and 31st, 15 h. 18.6 m.; full moon, 9th, 5 h. 24.0 m.; last quarter, 15th, 22 h. 13.8 m.; perigee, 11th, 12.9 h.; apogee, 27th, 13.6 h.

MIRAGE.

Mirages were observed during the month at the following places:
Dakota.—Henry and Webster, 27th.
Kansas.—Belleville, 9th; Salina, 15th, 17th, 18th, 24th, 29th.
Nebraska.—Marquette, 9th, 10th, 12th, 13th, 19th, 20th, 21st, 26th; Genoa, 9th.
Arizona.—Willcox, mirage seen nearly every day of the month.

MISCELLANEOUS PHENOMENA.

FOREST AND PRAIRIE FIRES.

Taylor, Williamson county, Texas: on the afternoon of the 14th a large area of prairie land, a few miles north of this place, was burned over. Five thousand sheep were surrounded by the fire; five hundred were killed and a large number injured.

Tahlequah, Indian Territory: a disastrous prairie fire occurred two miles north of this place on the afternoon of the 19th. The wind was blowing a gale at the time, causing the fire to spread rapidly and burn everything in its path; fences, hay, and out-buildings were destroyed, as well as many acres of prairie grass.

Eureka Springs, Carroll county, Arkansas: on the 18th, 19th, and 20th extensive forest fires were burning near this town. On the 20th the fire spread to the outskirts of the town and consumed two frame dwellings.

Forest and prairie fires were also reported from the following places:

Fort Reno, Indian Territory: prairie fires, 11th, 12th, 15th, 19th, 29th.

Fort Supply, Indian Territory: prairie fires, 19th, 20th, 21st, 27th, 28th.

Fort Sill, Indian Territory: prairie fire, 19th.

Silver Falls, Texas: prairie fires, 14th, 25th to 29th.

Duke, Florida: forest fire, 18th.

METEORS.

Oroville, Butte county, California: on the 2d, at 8 p. m., a meteor, of greenish color, started from a point about 30° west of the zenith and moved westward; as it progressed the color changed to red, and the meteor burst with a loud report.

Rockport, Essex county, Massachusetts: at 5.15 p. m. of the 3d a large and brilliant meteor passed over this town, moving from west to east; it was visible fully one minute. This meteor was also seen by the keeper of the breakwater lighthouse at Block Island, Rhode Island, who states that it was visible about one minute and disappeared seaward. The observer at Eastport, Maine, states that at 5.15 p. m. of the 3d a large meteor passed over that station from southwest to northeast, and was remarkable not only for its brilliancy but for the length of time that it was visible, about fifty seconds.

Riverside, San Bernardino county, California: Mr. A. K. Holt, voluntary observer at this place, furnishes the following descriptions of meteors observed by him during the month: "At exactly 7 o'clock (standard time), January 10th, a very bright meteor, like an immense ball of metal at white heat, appeared in the southeast about 10° above the horizon, moving from the north. In a few moments it exploded, scattering fire in every direction. The meteor was so bright that it cast a very clearly defined shadow, dimming the light of the full moon that was shining brightly at the time. On the evening of January 20th, at 7.32 (standard time), an extraordinarily bright meteor passed over from south to north, near the zenith, followed by a white trail thirty-five to forty degrees in length, giving the phenomenon the appearance of an immense bar of molten iron traversing the sky, the head of which continually threw off corruscations of fire." Reports of this meteor have been received from points one hundred and twenty-five miles south and sixty miles north of Riverside.

Cape Henlopen, Delaware: a brilliant meteor, about the size of an orange, and followered by a long train, was observed at 10 p. m. of the 23d, moving from north to south.

Meteors were also reported from the various stations, as follows:
Arizona.—Yuma, 10th.
Indiana.—Logansport, 10th; Butlerville, 20th; Vevay, 29th.
Iowa.—Monticello, 5th, 14th.
Kansas.—Wakefield, 4th; Salina, 4th, 28th, 29th; Wyandotte, 26th; El Dorado, 30th.
Massachusetts.—Dudley, 1st; Fall River, 3d.
Nebraska.—Fremont, 30th.
New Hampshire.—Berlin Mills, 3d.
New Jersey.—Beverly, 10th; Dover, 21st; Clayton, 31st.
Ohio.—Jacksonborough, 27th.
Oregon.—Linkville, 2d; Lakeview, 17th.
South Carolina.—Stateburg, 24th, 25th.
Texas.—Cleburne, 15th.
Virginia.—Rappahannock, 11th.
West Virginia.—Middlebrook, 26th.

MIGRATION OF BIRDS.

Geese flying southward.—Fort Reno, Indian Territory, 7th; Ashwood, Tennessee, 8th; Tatoosh Island, Washington Territory, 9th; Linkville, Oregon, 16th.

Geese flying northward.—Austin, Tennessee, and Marion, Virginia, 2d; Chattanooga, Tennessee, 8th; Salina, Kansas, and Fort Reno, Indian Territory, 15th; Stockham, Nebraska, 21st, 24th; Fort Madison, Iowa, 23d to 27th, 31st.

POLAR BANDS.

Polar bands were reported from the following stations:
Arkansas.—Lead Hill, 12th.
California.—Keeler, 1st, 4th, 5th, 25th.
Colorado.—Montrose, 24th, 31st.
Florida.—Archer, 20th, 28th, 30th.
Illinois.—Riley, 3d, 6th, 9th.
Iowa.—Cedar Rapids, 4th, 26th, 29th.
Kansas.—Allison, 5th; Salina, 14th, 15th, 17th, 23d, 29th.
Maine.—Gardiner, 7th, 9th, 11th, 13th.
Ohio.—Wauseon, 6th, 7th, 10th, 16th; Napoleon, 6th, 7th, 10th, 21st, 27th.
Tennessee.—Nashville, 5th, 6th.
Texas.—Abilene, 5th, 18th.
Virginia.—Dale Enterprise, 12th.

SAND STORMS.

Fort Grant, Arizona: a southeasterly gale set in at 11 a. m. of the 17th and continued until midnight, the wind blowing at a rate varying from thirty to forty-two miles per hour. The

high wind raised dense clouds of sand which nearly obscured the sun.

Abilene, Texas: during the 18th fresh southwest winds prevailed, increasing in force at night, and accompanied by heavy clouds of sand and dust. On the 19th a southwesterly gale set in, filling the atmosphere with sand to such an extent that the sun could not be seen until two hours after sunrise, and throughout the remainder of the day the sky was obscured to an altitude of 45° above the horizon. High winds, with heavy clouds of sand and dust, occurred also on the 7th, 16th, 19th, 25th, and 29th.

Sand storms also occurred at the following stations:
Rio Grande City, Texas, 17th, 19th, 20th, 21st, 23d, 27th.
Midland, Texas, 7th, 12th, 16th, 20th, 22d, 25th, 30th.
Corsicana, Texas, 19th.
Keeler, California, 27th.

SUN SPOTS.

Mr. H. Gowey, of North Lewisburg, Champaign county, Ohio, reports having observed sun spots on the 3d, 22d, 24th, and 29th.

M. A. Veeder, M. D., of Lyons, New York, gives the following observations in regard to points of the character indicated by him in the MONTHLY WEATHER REVIEW for October, 1886, on page 296:

On January 10th the ship "Constance" was struck by lightning, in latitude 40° north, longitude 68° west; and on that and the following day earthquake tremors were felt at Summerville, South Carolina, in West Virginia, and at San Francisco. The suspended magnet, as observed at Lyons, New York, at once acquired an average deflection of about a degree and a half westward, the daily range of movement from the point thus established being less than a quarter of a degree. This continued until February 1st, when a very active solar disturbance came into view by rotation, and unusual electrical storms occurred in the Ohio Valley and eastward, continuing from February 1st to February 4th, and was followed by earthquake shocks in Indiana on the 6th. On February 1st the range of movement of the magnet increased, until on the 5th it was a degree and a half, the magnet then returning for the first time to the position it had occupied previous to January 11th.

VERIFICATIONS.

INDICATIONS.

The predictions for January, 1887, were made by 2d Lieutenant F. M. M. Beall, Signal Corps, U. S. Army, Assistant, and were verified by 2d Lieutenant Frank Greene, Signal Corps, U. S. Army, Assistant.

The detailed comparison of the tri-daily indications for January, 1887, with the telegraphic reports of the twenty-four hours for which the indications were prepared, shows the general average percentage of verifications to be 73.63. The percentages for the different elements are: Weather, 72.20; wind, 70.26; temperature, 76.25. By states, etc., the percentages are: For Maine, 69.68; New Hampshire, 70.40; Vermont, 67.18; Massachusetts, 70.27; Rhode Island, 67.68; Connecticut, 70.81; New York, 72.69; Pennsylvania, 73.17; New Jersey, 77.63; Delaware, 74.60; Maryland, 76.50; District of Columbia, 73.71; Virginia, 73.61; North Carolina, 78.28; South Carolina, 78.15; Georgia, 81.32; Florida, 75.60; Alabama, 76.53; Mississippi, 72.03; Louisiana, 72.02; Texas, 73.71; Arkansas, 74.25; Tennessee, 75.00; Kentucky, 74.09; Ohio, 71.91; West Virginia, 63.84; Indiana, 74.19; Illinois, 76.37; Michigan, 75.19; Wisconsin, 72.61; Minnesota, 77.18; Iowa, 75.59; Kansas, 74.38; Nebraska, 70.97; Missouri, 79.27; Colorado, 63.47; east Dakota, 68.77.

There were seventeen omissions to predict, out of 9,951, or 0.17 per cent. Of the 9,934 predictions that have been made, eight hundred and eighty-eight, or 8.94 per cent., are considered to have entirely failed; six hundred and forty six, or 6.50 per cent., were one-fourth verified; 1,809, or 18.21 per cent., were one-half verified; 1,661, or 16.72 per cent., were three-fourths verified; 4,930, or 49.63 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

Below are given for the Pacific coast the percentages of indications verified for December, 1886; this data was received too late for publication in the REVIEW of that date. The predictions were made by 2d Lieutenant W. A. Glassford, Signal Corps, U. S. Army, Assistant; they were verified by 2d Lieutenant F. M. M. Beall, Signal Corps, U. S. Army, Assistant. The percentages for the different districts are: Washington Territory, 76.89; Oregon, 68.15; northern California, 78.05; southern California, 82.15.

CAUTIONARY SIGNALS.

Of the total number of signals ordered during January, 1887, it was practical to determine the verifications of one hundred and fifty-two; of these, one hundred and thirty-three, or 87.50 per cent., were fully verified both as to direction and velocity. Number of signals ordered for northeast winds, one; verified, none. Number of signals ordered for southwest winds, twenty-one; fully verified both as to direction and velocity, twenty, or 95.24 per cent. Number of signals ordered for northwest winds, ninety-nine; fully verified both as to direction and velocity, eighty-six, or 86.87 per cent. Number of signals ordered for winds without regard to direction, thirty-one; verified, twenty-seven, or 87.10 per cent. Number of signals ordered late, *i. e.*, after the verifying velocity had begun, eighteen, or 11.84 per cent.

In addition to the above, three hundred and forty-one signals were ordered at display stations, the verifications of which it was impracticable to determine.

In forty-one instances winds were reported which would have justified the display of cautionary signals, but for which no signals were ordered, and in four instances winds which would have justified the display of on-shore signals, but for which no signals were ordered.

COLD-WAVE SIGNALS.

Total number of cold-wave signals ordered, the verifications of which were determined, was two hundred and seventy-six; verified, two hundred, or 72.10 per cent. Seventy-two signals were ordered, the verifications of which it was impracticable to determine. In addition to the above, in twelve hundred and sixty-seven instances, the signals ordered from this office were repeated by the observers at the regular stations to towns in their vicinity. The verifications of these it was impracticable to determine.

RAILWAY WEATHER SIGNALS.

P. H. Mell, jr., director of the "Alabama Weather Service," in the report for January, 1887, states:

The verification of predictions for the whole area was 71 per cent. for temperature, and 83.4 per cent. for weather.

The following corporations comprise this system: South and North; Montgomery and Mobile; Mobile and Girard; Georgia Pacific; East Tennessee, Virginia and Georgia system in Alabama; Memphis and Charleston; Columbus and Western; Atlanta and West Point of Georgia; Northeastern of Georgia; Western and Atlantic; East Tennessee, Virginia and Georgia system in Georgia; Montgomery and Eufaula; Pensacola and Selma; Pensacola and Atlantic; the cities of Milledgeville, Georgia, and Talladega, Alabama.

The following is from the "Bulletin of the New England Meteorological Society" for January, 1887:

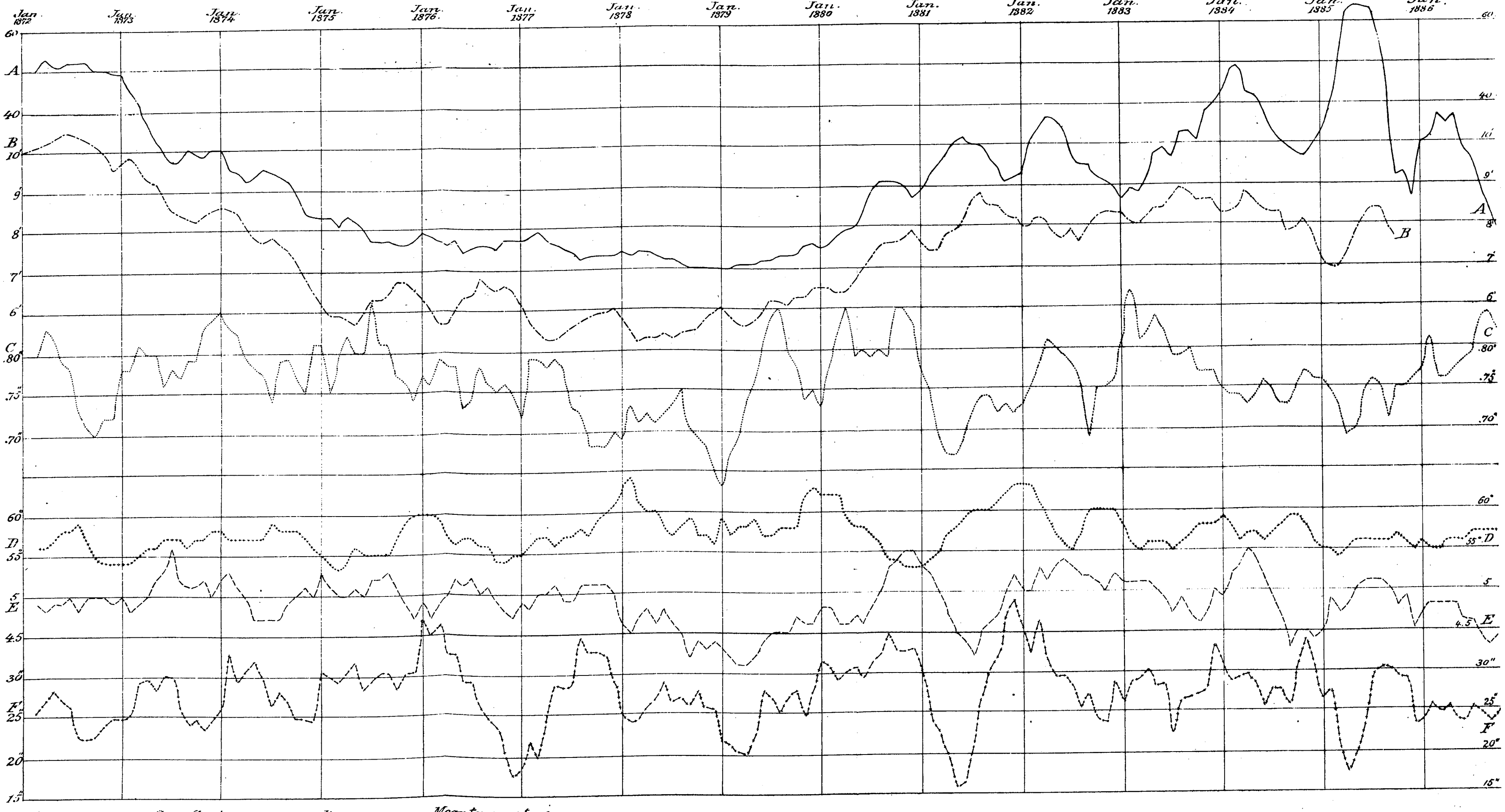
Verification of weather signals at New Haven was 83.9 per cent. for temperature, 80.6 for weather.

SUMMARY FOR THE YEAR 1886.

In the accompanying table are given for Signal Service stations the normal annual temperatures, as deduced from observations covering periods of from six to sixteen years; the mean temperature of the year 1886 with the departures from the normal; the maximum and minimum temperature of 1886 with the dates of occurrence; the normal yearly precipitation for each station; the total precipitation of 1886 and the departures from the normal.

The mean temperature of the year 1886 is exhibited by the dotted isothermal lines on chart vii; on the same chart are also shown, by the heavy unbroken line, the region in which the mean temperature of the year 1886 coincides with the normal, and, by the light unbroken lines, the departures, either above or below. The total precipitation of the year 1886 is shown on chart viii; in addition to the reports from Signal

SUN SPOTS AND METEOROLOGICAL PHENOMENA.



A ——— Sun Spots. D ..... Mean temperature.
B —·—·— Magnetic declination. E – – – – – Mean cloudiness.